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1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT





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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
DUCK LAKE, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Duck Lake is a 92 acre glacial lake, which is organizationally owned. The lake is located south of Fox Lake in Lake County, Illinois. It has a maximum depth of 8 feet, an average depth of 4 feet, and a storage capacity of 350 acre-feet (Table 1).

Duck Lake serves mainly as a recreational lake for the 300 families living on the lake, with some use as an agricultural water supply. Fishing, swimming, powerboating, waterskiing, waterfowl hunting and waterfowl observation are the major recreational uses of Duck Lake. Access is limited to members of Duck Lake Woods Subdivision.

The 1195 acre watershed of Duck Lake is estimated to be 65 percent residential. The lake shoreline is also primarily residential.

Deposition of sediment is considered to be a major problem for Duck Lake; suspended sediment, aquatic weeds, and water level fluctuation are considered moderate problems. Sewage plant effluent; urban storm drainage; septic tanks; pasture, grassland, and cropland runoff; fertilizer from lawns/golf courses, waterfowl; and sediment in the lake are cited as potential pollution sources. Sewers are being installed in the area.

TABLE 1. LAKE ASSESSMENT SUMMARY, DUCK LAKE, LAKE COUNTY, ILLINOIS (RT-B01ZG).

I. GENERAL INFORMATION

River Basin: Fox
Segment: B01

Ownership: 40 bottom owners

Surface Area (Acres): 92
Watershed Area (Acres): 1195
Maximum Depth (Feet): 8
Average Depth (Feet): 3.8
Storage Capacity (Acre/Feet): 349.6
Inflowing Stream(s): channel from Wooster L.
Outflowing Stream(s): channel to dam or Squaw Cr.
Water Retention Time:
Lake Type: glacial
Year Constructed:

II. USAGE

Public Access: no; organization members & guests only
Lake Usage:

Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: light
Cooling Water: none
Recreation: heavy
 Fishing: heavy
 Swimming: heavy
 Power Boating: moderate
 Row Boating or Canoeing: moderate
 Sailboating: light
 Camping: light
 Picnicking: light
 Waterfowl Hunting: moderate
 Waterfowl Observation: moderate
 Other: waterskiing-moderate

Recreational Facilities:
beaches, boat launches

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns): 70%
Golf Courses:
Pasture or Grassland:
Woodland: 10%
Row Crops:
Wetland: 20%
Other:

Watershed Usage (Percent):

Urban: 5%
Residential: 65%
Golf Courses:
Pasture or Grassland:
Woodland: 10%
Row Crops:
Wetland: 20%
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: poor

Conditions and Extent:

Suspended Sediment: moderate
Deposition of Sediment: large
Algal Blooms: slight
Aquatic Weeds: moderate
Taste and/or Odor: slight
Water Level Fluctuation: moderate
Fishkills: slight
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent: yes
Industrial Discharge:
Urban Storm Drainage: yes
Septic Tanks: yes
Pasture or Grassland Runoff: yes
Cropland Runoff: yes
Feedlot Runoff:
Construction Site Runoff: yes
Fertilizer or Pesticides from
 Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl: yes
Sediment in Lake: yes
Other:

V. LAKE MANAGEMENT

Comments: 1975, 1977, 1980-Chemical treatment
for aquatic weeds; Installation of sewers in the
area

Assessment and monitoring information on Duck Lake was provided by Jack Kmiecik, a member of the Duck Lake Water Improvement Association. Secchi disc depth, total depth and field observations were recorded at three sites (located in Figure 1) on five dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Duck Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Duck Lake

The average Secchi disc transparency of Duck Lake was 18.3 inches, which ranked number 66 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and in the range generally associated with use impairment problems in Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Duck Lake ranged from a minimum of 14 inches at all three sites on July 28 to a maximum of 22 inches at Sites 1 and 2 on May 8. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

The clarity of Duck Lake was uniformly low at all three sites. Transparency averaged 18.0 inches at Site 1 and 18.4 inches at Sites 2 and 3. The low Secchi readings were probably due, in part, to the shallow depth of the sites (average depth 3.4 feet) and resultant stirring up of sediment by wind and wave activity. It may reflect the large amount of nutrients and sediment throughout the lake.

Field observations indicate that the lack of transparency was due to both suspended sediment and algae. A brownish-green water color was observed and algal colonies were noted on several sampling dates. Aquatic weeds were noted as abundant at all three sites. This may reflect the shallow nature of the sites and/or the occurrence of nutrient input there.

Since Secchi measurements were not taken in August, September and October, seasonal differences in the transparency of Duck Lake could not be completely described.

FIGURE 1

DUCK LAKE

LAKE COUNTY



1/4 MILE

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) DUCK/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 8	22.0	22.0	20.0	21.3	1.2
05/ 10	18.0	18.0	20.0	18.7	1.2
06/ 10	10.0	10.0	20.0	10.3	1.2
06/ 21	10.0	10.0	18.0	10.0	0.0
07/ 26	14.0	14.0	14.0	14.0	0.0

SUMMARY STATISTICS

LAKE					
MEAN	STD DEV	MIN	MAX	AV DEPTH	
18.0	2.8	10.4	18.4	18.3	
14.0	1.0	14.0	14.0	14.0	
22.0	2.0	22.0	20.0	22.0	
12.4	2.4	4.8	3.1	8	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) DUCK/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 8	2.5	6.0	3.0	3.8	1.9
05/ 10	2.5	4.5	4.0	3.5	0.9
06/ 10	1.5	4.5	3.0	3.0	1.5
06/ 21	1.5	4.5	3.0	3.0	1.5
07/ 28	4.0	4.0	2.5	3.8	1.3

LAKE					
MEAN	STD DEV	MIN	MAX	AV DEPTH	
2.4	1.0	0.8	4.0	2.5	
1.5	0.5	0.0	2.5	1.5	
4.0	0.0	4.0	4.0	4.0	
2.4	0.8	0.0	3.1	2.4	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) DUCK LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

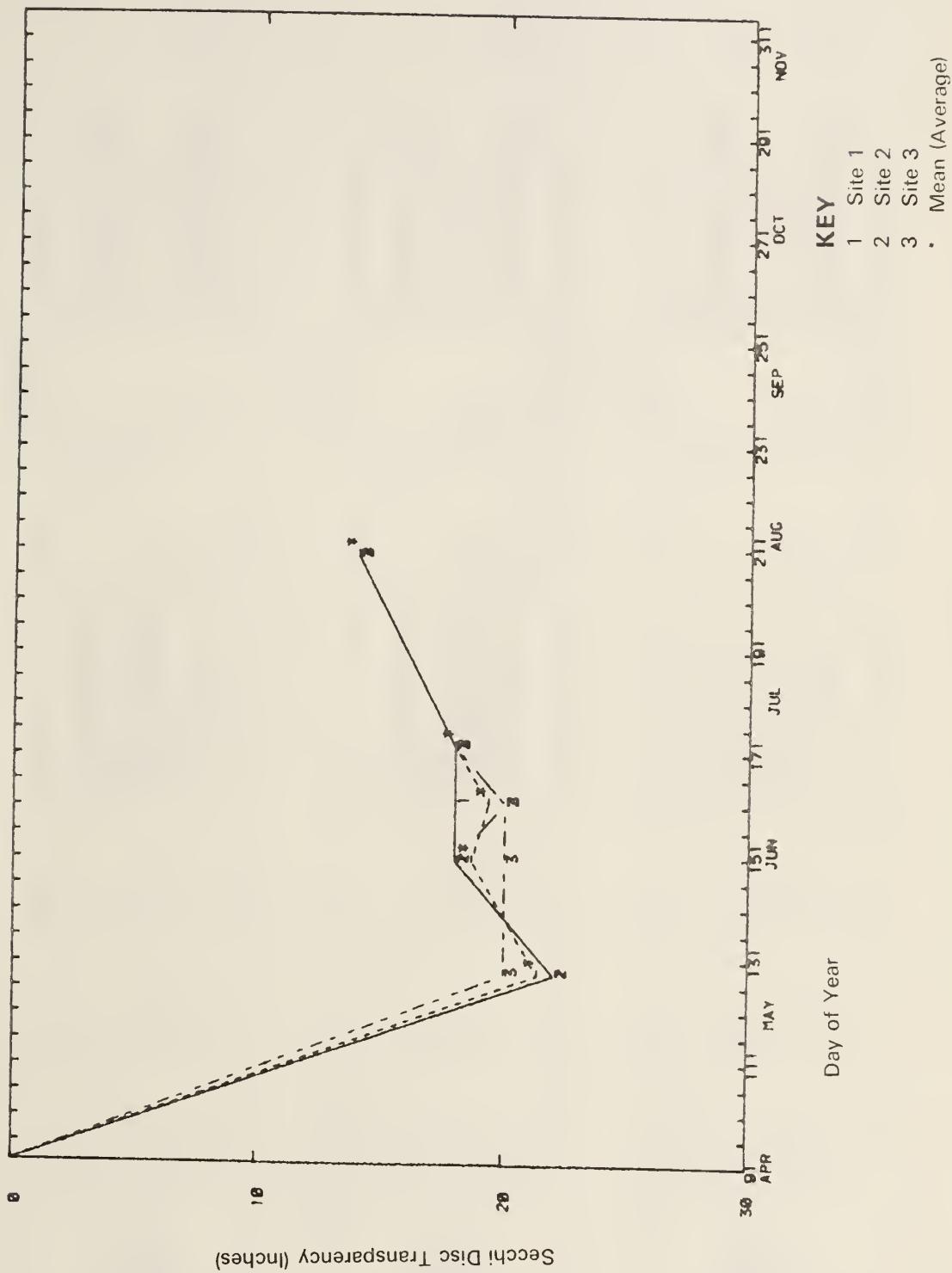


TABLE 4. FIELD OBSERVATIONS, DUCK LAKE, LAKE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal slight slight refuse algal col. no odor	brnsh-grn minimal minimal moderate waterfowl no odor	brnsh-grn minimal minimal minimal detritus no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: E	overcast no rain ripple warm	few clouds no rain ripple cool E	WATER LEVEL OF LAKE: above normal 3-4' RECREATIONAL USAGE: fishing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn minimal minimal moderate slight refuse * detritus no odor	grn-brn minimal minimal slight none no odor	grn-brn minimal minimal large large detritus no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: E	many clouds no rain ripple warm	overcast mod. rain ripple warm	WATER LEVEL OF LAKE: above normal 2-3' RECREATIONAL USAGE: fishing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

*clumps of sediment
waterfowl

-7-

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/10/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal slight large large detritus * algal mats fishy	brnsh-grn minimal moderate moderate none fishy	brnsh-grn minimal minimal large large large none fishy	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: E	hazy no rain ripple warm	hazy no rain ripple warm	WATER LEVEL OF LAKE: above normal 3' RECREATIONAL USAGE: fishing, row boating/canoeing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

*duckweed

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal large refuse * detritus fishy	brnsh-grn minimal minimal large large moderate none fishy	brnsh-grn minimal minimal large large large large musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: NW	overcast no rain ripple warm NW	many clouds v. lt. rain ripple warm NW	WATER LEVEL OF LAKE: above normal 4-6' RECREATIONAL USAGE: fishing, swimming row boating/canoeing, picnicking LAKE MANAGEMENT: 2/4D for Aquatic vegetation 40% of lake ADDITIONAL COMMENTS:

*algal mats, duckweed

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grnsh-brn slight slight large large refuse detritus no odor	grnsh-brn slight minimal slight slight none no odor	brnsh-grn slight minimal moderate slight detritus no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast v. 1t. rain small cool S Jack Kmiecik	overcast mod. rain small warm	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

*algal mats, duckweed

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR; SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Duck Lake (estimated at twice the Secchi depth) ranged from 2.3-3.7 feet at Site 1, from 2.3-3.7 feet at Site 2, and from 2.3-3.3 feet at Site 3. Since Duck Lake is so shallow (average depth 3.8 feet), the bottom waters will probably remain oxygenated by mixing due to wind regardless of the Secchi disc depth.

SUMMARY AND RECOMMENDATIONS

Summary

Duck Lake, a shallow recreational lake in northeastern Illinois, was sampled on five dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Jack Kmiecik recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Duck Lake (18.3 inches) ranked 66th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems in Illinois lakes.

Duck Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, urban storm drainage, fertilization of lawns, and waterfowl should also be investigated and minimized. Harvesting of aquatic weeds or use of screens for weed control might also be considered in addition, or as an alternative, to chemical control.

Continued monitoring is recommended for Duck Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relatively uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

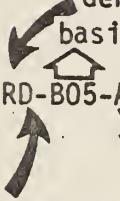
zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - Tight
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:

Anderson Lake

 denotes lake as opposed to stream
basin segment and sub-segment
RD-B05-A
letter denoting specific lake within a basin segment
basin code
D = Illinois River Basin

*Definitions of items in sense used in text

DS:sp,6207a,1-8

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VOLUNTEER LAKE MONITORING PROGRAM SPRIN

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF WATER POLLUTION CONTROL
2200 CHURCHILL ROAD
SPRINGFIELD, ILLINOIS 62706



NATURAL HISTORY SUPPLY
AUG 23 1982
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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT



1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
DOG BONE LAKE, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Dog Bone Lake is a 16 acre glacial lake located in Lake County, 8 miles north of Barrington, Illinois. It is owned by Stone Enterprises. The lake has a maximum depth of 16 feet, an average depth of 5 feet, and a storage capacity of 89 acre-feet (Table 1).

Dog Bone Lake is not currently used by the developer. However, it is anticipated that non-motorized boating usage will increase in the future. The lake has been recently dredged. Access is limited.

The 200 acre watershed of Dog Bone Lake is estimated to be 40 percent pasture or grassland. The lake shoreline is also primarily pasture or grassland.

Deposition of sediment is considered a moderate problem in Dog Bone Lake. Septic tanks; pasture, grassland, cropland, and construction site runoff; fertilizer or pesticides from lawns/golf courses and sediment in the lake are cited as potential pollution sources.

Assessment and monitoring information was provided by Pat Foersterling. Secchi disc depth, total depth and field observations were recorded at three sites (located in Fig. 1) on five dates in 1981.

TABLE 1. LAKE ASSESSMENT, DOG BONE LAKE, LAKE COUNTY, ILLINOIS (VT-B02-B).

I. GENERAL INFORMATION

River Basin: Fox
Segment: B02

Ownership: Stone Enterprises
Chicago, Illinois
Surface Area (Acres): 16
Watershed Area (Acres): 200
Maximum Depth (Feet): 16
Average Depth (Feet): 5
Storage Capacity (Acre/Feet): 80
Inflowing Stream(s): -
Outflowing Stream(s): -
Water Retention Time: 0.6 year
Lake Type: Glacial Lake
Year Constructed:

II. USAGE

Public Access: no
Lake Usage:
Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation: none
 Fishing: none
 Swimming: none
 Power Boating: none
 Row Boating or Canoeing: none
 Sailboating: none
 Camping: none
 Picnicking: none
 Waterfowl Hunting:
 Waterfowl Observation:
 Other:

Recreational Facilities:
none

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns):
Golf Courses:
Pasture or Grassland: 75%
Woodland: 10%
Row Crops:
Wetland: 15%
Other:

Watershed Usage (Percent):

Urban:
Residential: 10%
Golf Courses:
Pasture or Grassland: 40%
Woodland: 10%
Row Crops: 30%
Wetland: 10%
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: fair

Conditions and Extent:

Suspended Sediment: minimal
Deposition of Sediment: moderate
Algal Blooms: minimal
Aquatic Weeds: slight
Taste and/or Odor: minimal
Water Level Fluctuation: minimal
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

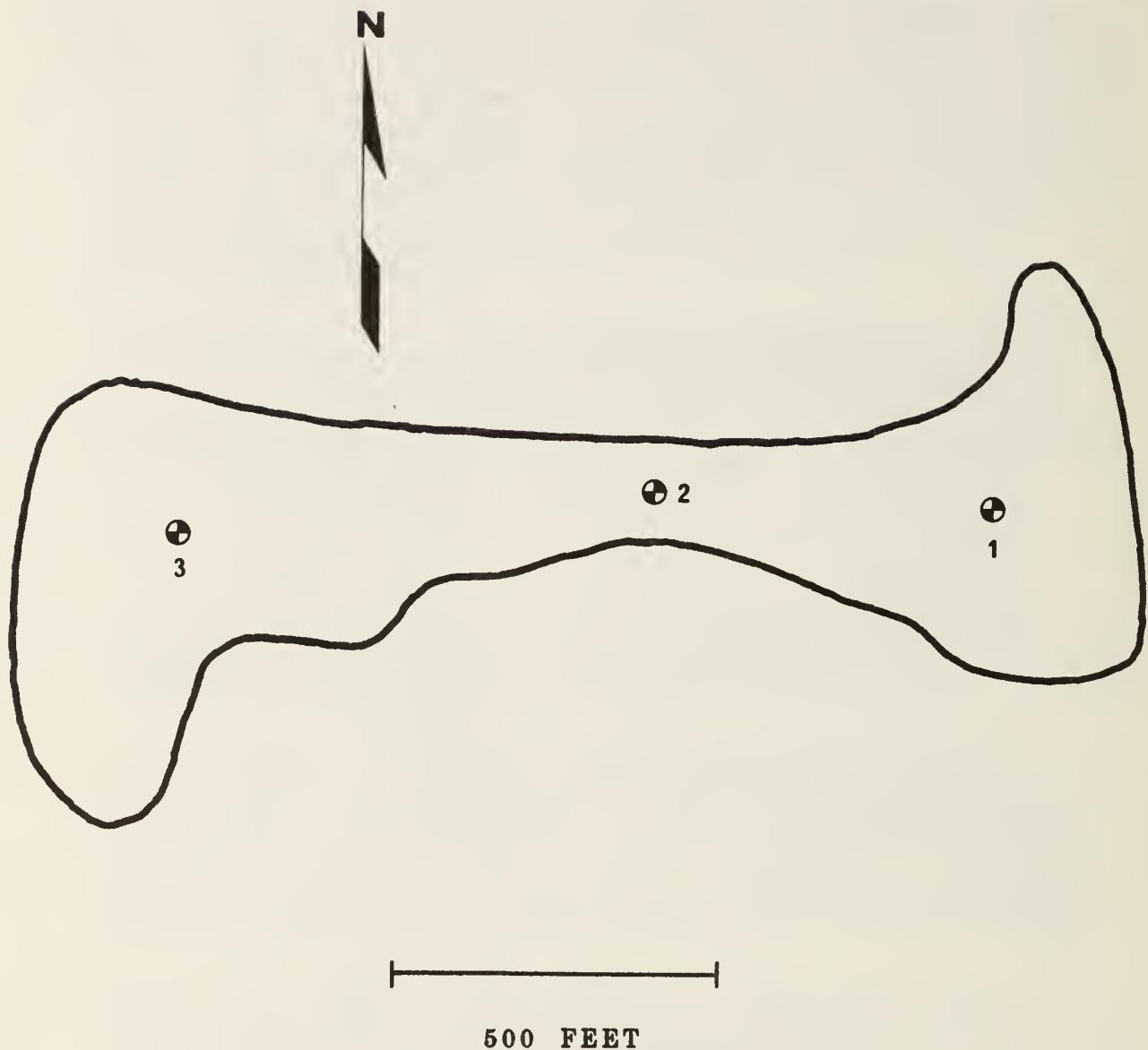
Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks: yes
Pasture or Grassland Runoff: yes
Cropland Runoff: yes
Feedlot Runoff:
Construction Site Runoff: yes
Fertilizer or Pesticides from
 Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake: yes
Other:

V. LAKE MANAGEMENT

Comments: _____

FIGURE 1
DOGBONE LAKE
LAKE COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Dog Bone Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Dog Bone Lake

The average Secchi disc transparency of Dog Bone Lake was 25.9 inches, which ranked number 53 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Dog Bone Lake ranged from a minimum of 14 inches at Sites 1 and 3 on May 26 to a maximum of 42 inches at Site 1 on July 31, at Site 2 on July 16 and July 31 and at Site 3 on July 16. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

The clarity of Dog Bone Lake was relatively uniform at the three sites. Transparency averaged 24.6 inches, 27.6 inches and 25.4 inches at Sites 1, 2 and 3, respectively. The low transparencies were probably related, in part, to the shallow depths of the sites (average depth 5.9 feet) and resultant stirring up of sediment by wind and wave activity. It may also reflect high input of nutrients and sediment.

Since Secchi measurements were not taken in June, August, September, and October, seasonal differences in the transparency of Dog Bone Lake could not be determined.

Field observations indicate that the lack of transparency in Dog Bone Lake was due primarily to suspended sediment. A brown water color and moderate to large amounts of suspended sediment were noted on the days with the lowest transparencies.

TABLE 2
SECCHI DISC TRANSPARENCY (INCHES) DOG BONE/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
84/ 26	14.0	18.0	14.0	15.3	2.3
85/ 9	19.0	18.0	21.0	19.3	1.5
85/ 20	18.0	18.0	20.0	18.7	1.2
87/ 16	39.0	42.0	42.0	38.0	6.0
87/ 31	42.0	36.0	36.0	36.0	6.0

SUMMARY STATISTICS

SITES	LAKE				
	MEAN	STD DEV	MIN	MAX	AV DEPTH
	24.6	27.6	25.4	25.9	
	11.4	13.1	10.9	11.1	
	14.0	18.0	14.0	14.0	
	42.0	42.0	42.0	42.0	
	5.8	6.4	5.6	5.6	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3
DEPTH OF SITE (FEET) DOG BONE/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
84/ 26	4.0	5.0	6.0	5.0	1.0
85/ 9	6.5	6.0	5.0	5.8	0.8
85/ 20	6.5	6.0	5.0	5.8	0.8
87/ 16	4.5	7.5	7.5	6.5	1.7
87/ 31	7.5	7.5	4.5	6.5	1.7

SUMMARY STATISTICS

SITES	LAKE				
	MEAN	STD DEV	MIN	MAX	AV DEPTH
	5.0	6.1	5.6	5.9	
	1.5	1.2	1.2	1.2	
	4.0	4.5	4.5	4.8	
	7.5	7.5	7.5	7.5	
	5.8	6.4	5.6	5.6	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) DOG BONE LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

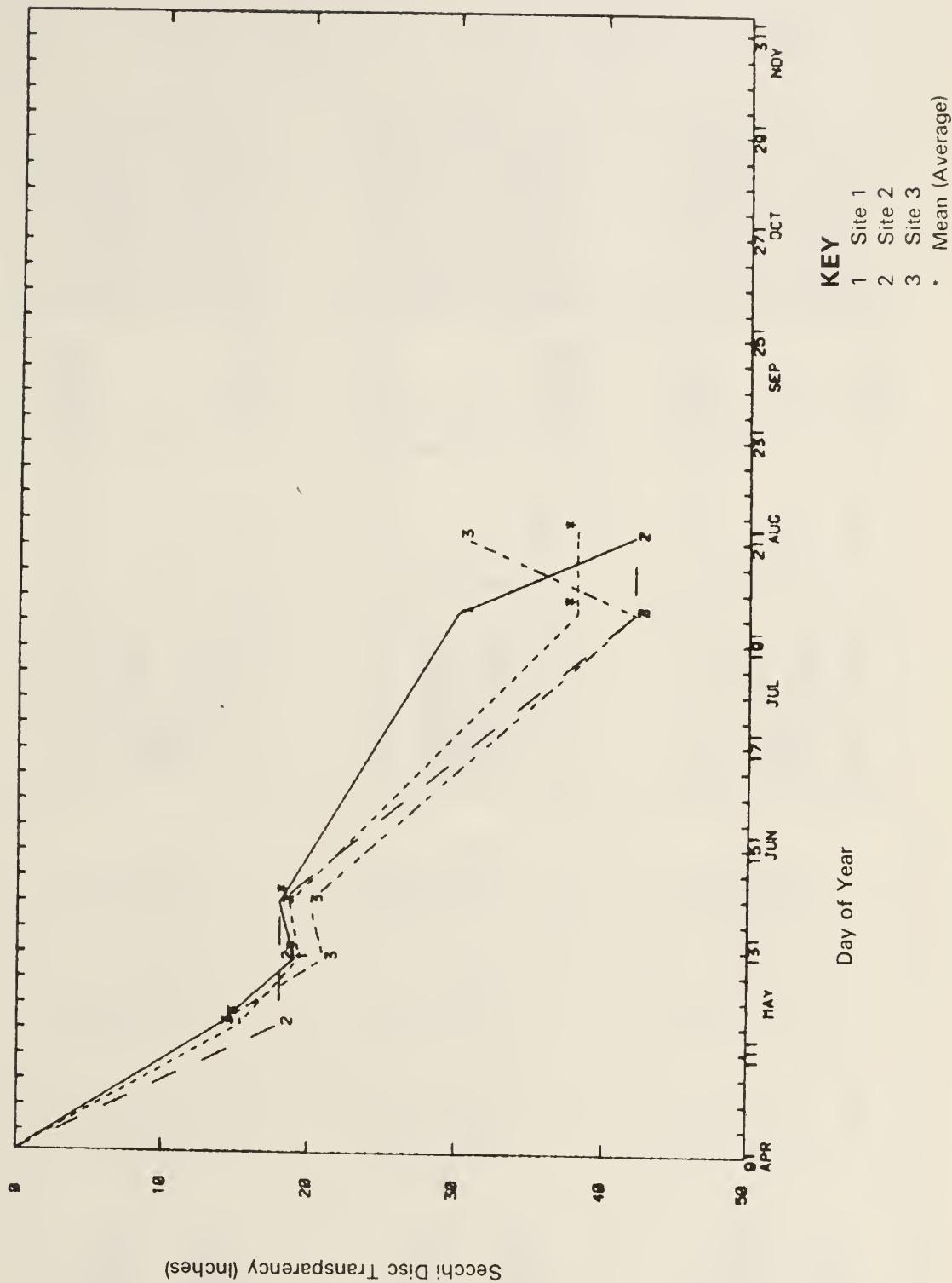


TABLE 4. FIELD OBSERVATIONS, DOG BONE, LAKE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
4/26/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown large minimal minimal minimal none no odor	brnsh-grn large minimal minimal minimal none no odor	lt. brown large minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm NE	overcast no rain ripple cool NE	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS: Pat Foersterling

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate minimal minimal slight none no odor	grn-brn moderate minimal minimal slight none no odor	brnsh-grn moderate minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear calm cool W	few clouds calm cool W	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS: Pat Foersterling

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/20/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate minimal minimal slight none no odor	brnsh-grn moderate minimal minimal slight none no odor	brnsh-grn moderate minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear calm cool	clear calm cool	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS: Pat Foersterling

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/16/81	WATER COLOR; SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green minimal minimal minimal minimal none no odor	lt. green minimal minimal minimal minimal none no odor	lt. green minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds calm warm	hazy calm cool	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none LAKE MANAGEMENT: none ADDITIONAL COMMENTS: Pat Foersterling

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate minimal minimal minimal none no odor	grn-brn moderate minimal minimal minimal none no odor	grn-brn moderate minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear calm cold S Pat Foersterling	few clouds calm cold S	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: row boating/canoeing LAKE MANAGEMENT: no treatment ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:		WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:	

-8-

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:		WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:		WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:	

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Dog Bone Lake (estimated at twice the Secchi depth) ranged from 2.3 - 7.0 feet at Site 1, 3.0 - 7.0 feet at Site 2, and 2.3 - 7.0 feet at Site 3. Since Dog Bone Lake is shallow (average depth 5.0 feet), bottom waters probably will remain oxygenated by mixing due to wind.

SUMMARY AND RECOMMENDATIONS

Summary

Dog Bone Lake, a small private recreational lake in northeastern Illinois, was sampled on five dates between April 26 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Pat Foersterling recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Dog Bone Lake (25.9 inches) ranked 53rd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, was in the normal range for Illinois lakes and was compatible with most recreational uses.

Dog Bone Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks and fertilization of lawns should also be investigated and minimized.

Continued monitoring is recommended for Dog Bone Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relatively uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - Tight
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:

Anderson Lake

RD-B05-A

D = Illinois River Basin

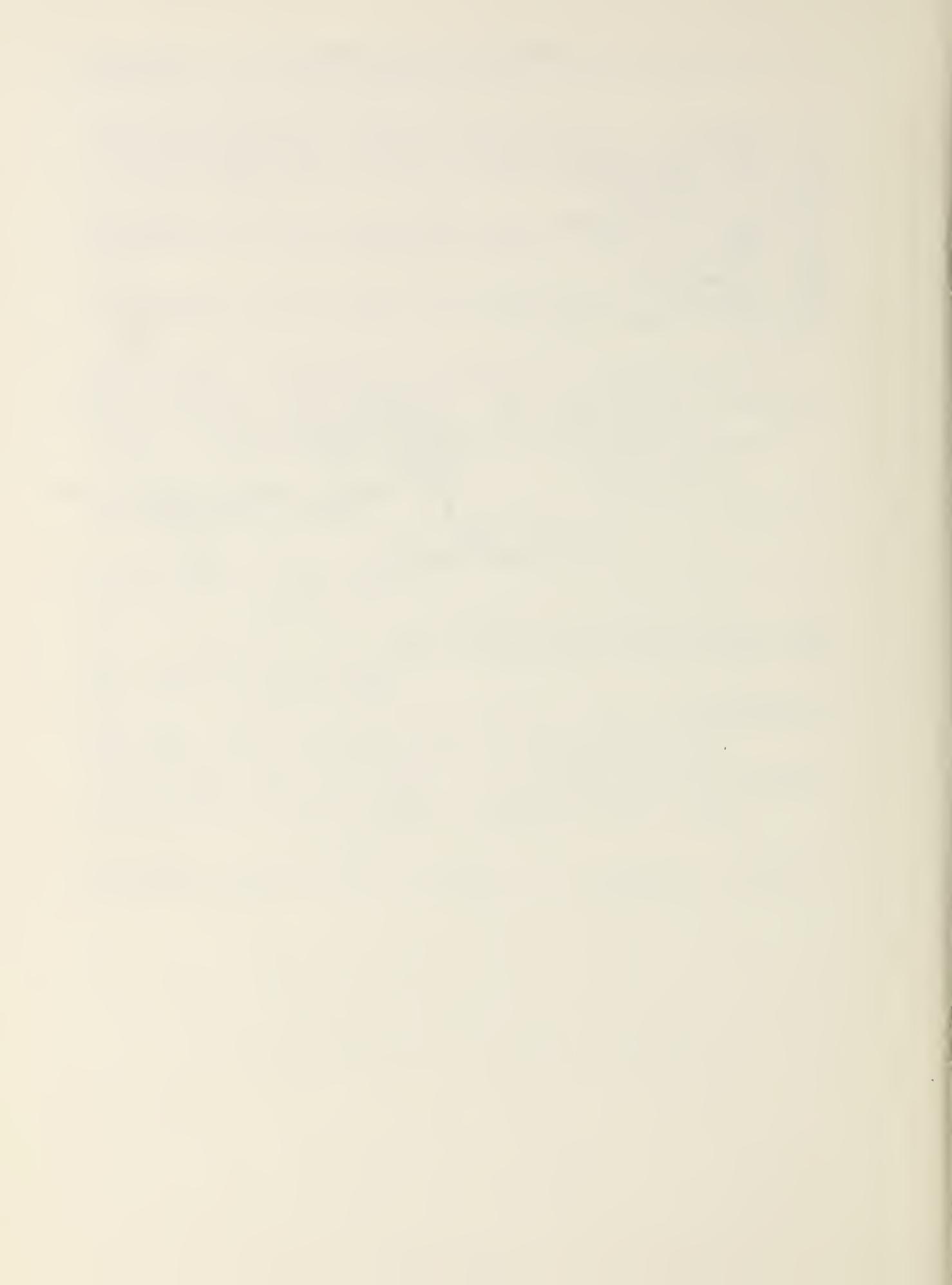
basin code

denotes lake as opposed to stream
basin segment
and sub-segment

letter denoting specific lake
within a basin segment

*Definitions of items in sense used in text

DS:sp,6207a,1-8



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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1981/18

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1981 VOLUNTEER LAKE

NATURAL HABITAT

AUG 2 1981

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
LAKE DECATUR, MACON COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Special volunteer monitoring programs to include additional sites, a greater frequency of sampling, and surface water samples collected by volunteers to be analyzed by Illinois EPA laboratories were developed for certain lakes (e.g., Lake Decatur).

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Decatur is a 3,093 acre impoundment owned by the City of Decatur, Macon County, Illinois. It was constructed in 1922 by damming the Sangamon River and Big Creek. It has a maximum depth of 23 feet, an average depth of 7.2 feet and a storage capacity of 22,270 acre feet (Table 1).

Lake Decatur serves not only as a potable water supply, but is used as an agricultural, industrial and cooling water supply. Major recreational uses associated with the lake include fishing, power boating, canoeing and row boating, sailboating, picnicking, and waterfowl hunting. Access is generally unlimited.

The 597,497 acre watershed of Lake Decatur is estimated to be 90 percent row crops, 5 percent pasture, and 4 percent woodland. The lake shoreline is primarily residential.

TABLE 1. LAKE ASSESSMENT SUMMARY, LAKE DECATUR, MACON COUNTY, ILLINOIS (RE-B02-A)

I. GENERAL INFORMATION

River Basin: Sangamon
 Segment: B02

Ownership: public, City of Decatur

Surface Area (Acres): 3,093
 Watershed Area (Acres): 597,497
 Maximum Depth (Feet): 23.0
 Average Depth (Feet): 7.2
 Storage Capacity (Acre/Feet): 22,270
 Inflowing Stream(s): Sangamon R; Big Creek
 Outflowing Stream(s): Sangamon River
 Water Retention Time: 0.030 year
 Lake Type: Dammed stream
 Year Constructed: 1922

II. USAGE

Public Access: yes

Lake Usage:

- Potable Water Supply: X
- Industrial Water Supply: X
- Agricultural Water Supply: X
- Cooling Water: X
- Recreation:
- Fishing: X
- Swimming:
- Power Boating: X
- Row Boating or Canoeing: X
- Sailboating: X
- Camping:
- Picnicking: X
- Waterfowl Hunting: X
- Waterfowl Observation:
- Other:

Recreational Facilities:

Watershed Usage (Percent):

Urban:	1
Residential:	
Golf Courses:	
Pasture or Grassland:	5
Woodland:	4
Row Crops:	90
Wetland:	
Other:	

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
 Fishing:

Conditions and Extent:

Suspended Sediment:	large
Deposition of Sediment:	moderate
Algal Blooms:	slight
Aquatic Weeds:	minimal
Taste and/or Odor:	slight
Water Level Fluctuation:	slight
Fishkills:	slight
Other:	

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:	X
Industrial Discharge:	X
Urban Storm Drainage:	X
Septic Tanks:	X
Pasture or Grassland Runoff:	X
Cropland Runoff:	X
Feedlot Runoff:	
Construction Site Runoff:	
Fertilizer or Pesticides from Lawns/Golf Courses:	X
Orchards:	
Forestry Operations Runoff:	
Mining:	
Waterfowl:	
Sediment in Lake:	X
Other: Fish Activity	

V. LAKE MANAGEMENT

Comments:

Suspended sediment and deposition of sediment are considered to be the primary problems for Lake Decatur. Urban storm drainage, septic tanks, pasture or grassland runoff, cropland runoff, industrial discharge, sewage treatment plant effluent, and fertilizer or pesticides from lawns and/or golf courses are cited as potential pollution sources.

Assessment information on Lake Decatur was provided by the Illinois Department of Conservation (1977). Monitoring was performed by James R. Mayhugh of the Decatur Water Department, and Brad Brown, Greg Stengel, Charles Stone, and Jake Watson of the Decatur Lake Patrol. Secchi disc depth, total depth, and field observations were recorded at three sites (located Figure 1) on 47 dates between June 3 and October 21, 1981. In addition, surface water samples were collected by the Decatur Lake Patrol for analysis of turbidity, total suspended solids, and volatile suspended solids on eight dates in July and August, 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Lake Decatur are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations data are summarized in Table 4. Results for turbidity, total suspended solids (TSS), and volatile suspended solids (VSS) are presented in Tables 5, 6, and 7.

General Water Quality of Lake Decatur

The average Secchi disc transparency of Lake Decatur was 8.5 inches, which ranked number 84 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Mean (+ Standard Deviation) surface water turbidity was 20.4 (+ 12.1) NTU; TSS, 47.4 (+ 36.5) mg/l; and VSS, 7.4 (+ 5.8) mg/l; as compared to an average of 9.4 (+ 10.1) NTU turbidity; 17.3 (+ 13.2) mg/l TSS; and 6.5 (+ 19.8) mg/l VSS for 65 Illinois lakes sampled in 1980-1981. Thus, the turbidity and suspended matter in Lake Decatur was above average for Illinois lakes.

FIGURE 1

LAKE DECATUR

MACON COUNTY

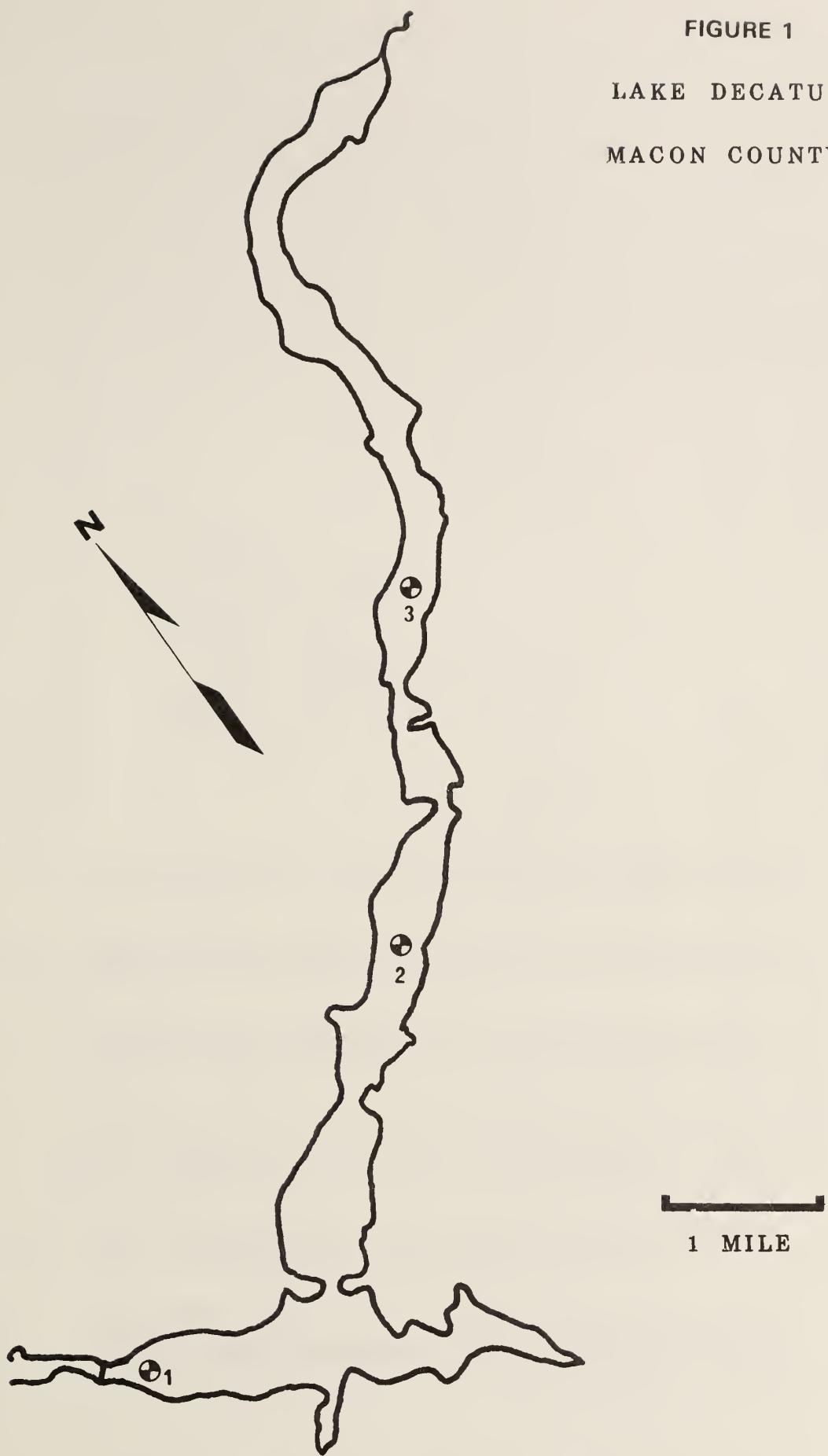


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) DECATUR/MACON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
86/ 3	27.0	-1.0	-1.0	27.0	-1.0
86/ 5	9.8	-1.0	-1.0	9.8	-1.0
87/ 1	9.8	-1.0	-1.0	9.8	-1.0
87/ 2	8.8	10.0	10.0	9.3	1.2
87/ 6	11.0	4.0	4.0	6.5	4.0
87/ 7	7.0	5.0	5.0	5.7	1.2
87/ 8	6.0	6.0	4.0	5.3	1.2
87/ 9	6.0	6.0	5.0	5.7	0.6
87/ 10	7.0	7.0	6.0	6.7	0.6
87/ 12	12.0	12.0	12.0	12.0	0.0
87/ 13	12.0	12.0	12.0	12.0	0.0
87/ 14	14.0	14.0	14.0	14.0	0.0
87/ 15	18.0	13.0	13.0	12.7	3.5
87/ 16	17.0	11.0	11.0	11.3	5.5
87/ 17	24.0	12.0	8.0	14.7	8.3
87/ 20	13.0	7.0	3.0	7.7	5.0
87/ 21	11.0	7.0	5.0	7.7	3.1
87/ 22	13.0	8.0	6.0	9.0	3.6
87/ 23	12.0	7.0	4.0	7.7	4.0
87/ 24	18.0	6.0	5.0	7.0	2.6
87/ 25	12.0	7.0	6.0	8.3	3.2
87/ 27	19.0	7.0	5.0	7.3	2.5
87/ 28	19.0	6.0	4.0	6.7	3.1
87/ 29	11.0	6.0	4.0	7.0	3.6
87/ 30	6.0	4.0	3.0	4.3	1.5
87/ 31	6.0	4.0	4.0	4.0	1.2
88/ 1	6.0	5.0	4.0	5.0	1.0
88/ 2	11.0	9.0	6.0	8.0	2.5
88/ 4	13.0	14.0	8.0	11.7	3.2
88/ 5	16.0	14.0	10.0	13.3	3.1
88/ 6	16.0	7.0	4.0	9.0	6.2
88/ 7	12.0	4.0	4.0	6.7	4.6
88/ 8	14.0	7.0	4.0	8.3	5.1
88/ 9	15.0	6.0	6.0	9.7	4.7
88/ 11	12.0	9.0	6.0	9.0	3.0
88/ 12	12.0	7.0	5.0	8.0	3.6
88/ 13	12.0	6.0	5.0	7.7	3.0
88/ 14	19.0	8.0	6.0	8.0	2.0
88/ 15	6.0	4.0	3.0	4.3	1.5
88/ 16	6.0	4.0	4.0	4.7	1.2
88/ 19	6.0	4.0	3.0	4.3	1.5
88/ 20	7.0	7.0	5.0	6.3	1.2
88/ 21	8.0	-1.0	-1.0	6.0	1.0
89/ 8	12.0	-1.0	-1.0	12.0	-1.0
89/ 21	15.0	-1.0	-1.0	15.0	-1.0
89/ 21	12.0	-1.0	-1.0	12.0	-1.0
10/ 21	20.0	-1.0	-1.0	20.0	-1.0

SUMMARY STATISTICS

SITES	LAKE
MEAN	11.5
STD DEV	4.6
MIN	6.0
MAX	27.0

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) DECATUR/MACON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

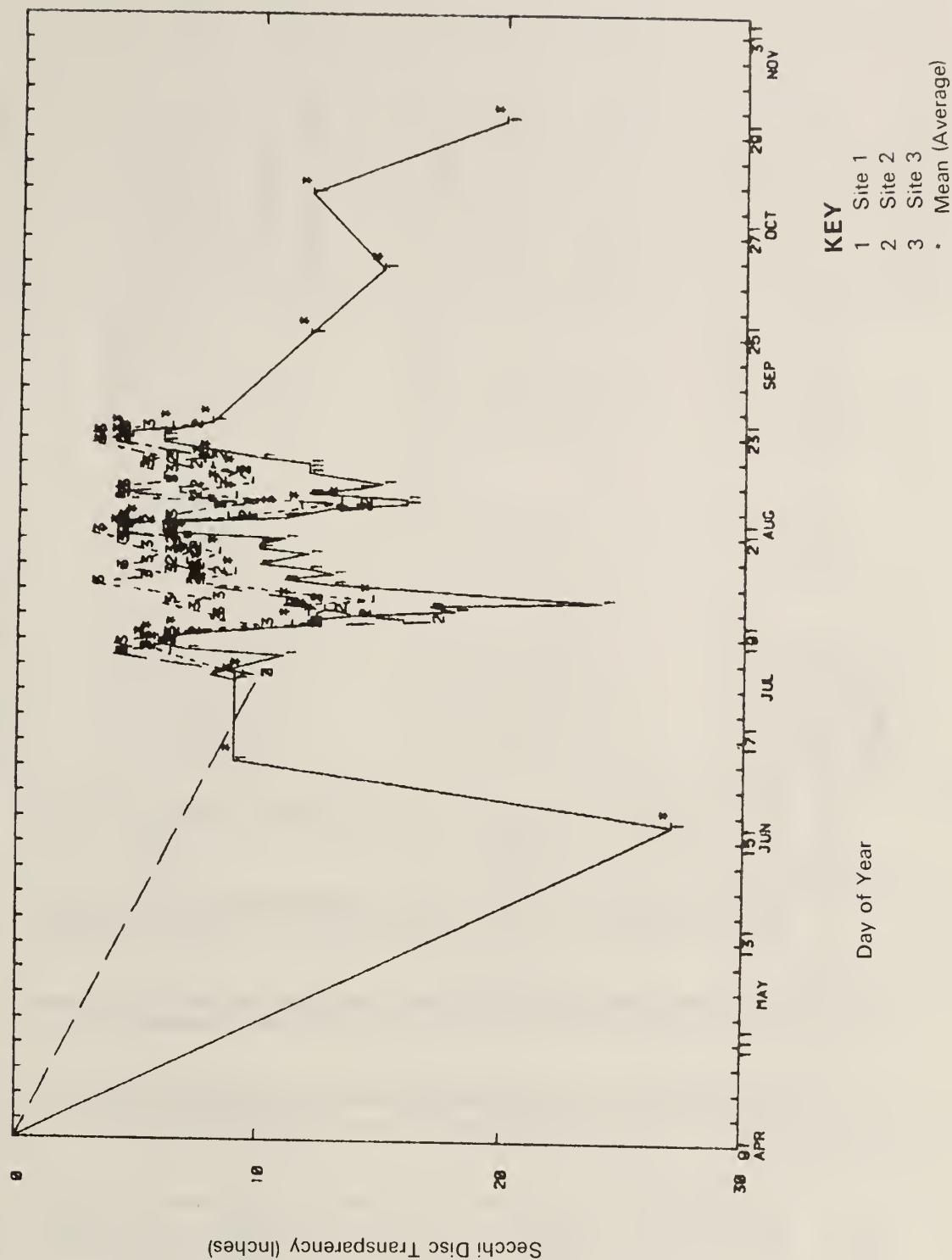


TABLE 3

DEPTH OF SITE (FEET) DECATUR/RACON COUNTY, ILLINOIS (VOLUNTEER DATA '98)

DATE	SITE 1			SITE 2			SITE 3		
	MEAN	STD DEV	LAKE	MEAN	STD DEV	LAKE	MEAN	STD DEV	LAKE
06/ 3	18.5	-1.0		-1.0	18.5		18.5	-1.0	
06/ 5	18.5	-1.0		-1.0	18.5		18.5	-1.0	
07/ 1	18.5	-1.0		-1.0	18.5		18.5	-1.0	
07/ 2	15.0	8.0		5.0	9.3		5.1	5.1	
07/ 6	18.5	8.5		5.0	9.3		5.1	5.1	
07/ 7	15.0	8.0		5.0	9.3		5.1	5.1	
07/ 8	15.0	8.0		5.0	9.3		5.1	5.1	
07/ 9	16.0	6.0		5.0	9.7		5.7	5.7	
07/ 10	18.0	8.0		5.0	9.0		6.7	6.7	
07/ 12	17.0	16.0		5.0	9.0		6.2	6.2	
07/ 13	16.0	8.0		5.0	9.0		5.6	5.6	
07/ 14	18.0	8.0		5.0	9.0		6.7	6.7	
07/ 15	15.5	8.0		5.0	9.5		5.4	5.4	
07/ 16	16.0	8.0		5.0	9.0		5.7	5.7	
07/ 17	18.0	8.0		5.0	9.7		6.6	6.6	
07/ 20	16.0	8.0		5.0	9.0		5.7	5.7	
07/ 21	18.0	8.0		5.0	9.0		6.7	6.7	
07/ 22	15.0	8.0		5.0	9.5		5.1	5.1	
07/ 23	14.0	8.0		5.0	9.3		4.5	4.5	
07/ 24	16.0	8.0		5.0	9.7		5.7	5.7	
07/ 26	15.0	8.0		5.0	9.3		5.1	5.1	
07/ 27	17.0	8.0		5.0	9.2		6.2	6.2	
07/ 28	18.0	8.0		5.0	9.0		6.8	6.8	
07/ 29	18.0	8.0		12.0	5.0		5.3	5.3	
07/ 30	14.0	8.0		5.0	9.7		4.5	4.5	
07/ 31	17.0	8.0		5.0	9.0		6.2	6.2	
08/ 1	17.0	8.0		5.0	9.0		6.2	6.2	
08/ 2	17.0	8.0		5.0	9.0		6.2	6.2	
08/ 4	14.0	8.0		5.0	9.0		4.6	4.6	
08/ 5	13.0	8.0		4.0	9.0		4.5	4.5	
08/ 6	14.0	8.0		5.0	9.0		4.6	4.6	
08/ 7	17.0	8.0		5.0	9.5		5.9	5.9	
08/ 8	16.0	8.0		5.0	9.0		5.6	5.6	
08/ 9	14.0	8.0		6.0	9.7		4.6	4.6	
08/ 11	6.5	8.0		5.0	9.0		6.5	6.5	
08/ 12	15.0	8.0		5.0	9.7		5.8	5.8	
08/ 13	16.0	8.0		6.0	9.7		5.8	5.8	
08/ 14	16.0	8.0		5.0	9.0		5.6	5.6	
08/ 15	16.0	8.0		5.0	9.0		5.7	5.7	
08/ 16	16.0	8.0		5.0	9.0		5.6	5.6	
08/ 17	16.0	8.0		4.0	9.3		6.1	6.1	
08/ 18	16.0	8.0		5.0	9.0		5.6	5.6	
08/ 19	16.0	8.0		5.0	9.0		4.8	4.8	
08/ 20	13.0	8.0		5.0	9.0		4.8	4.8	
08/ 21	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 22	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 23	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 24	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 25	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 26	18.5	-1.0		-1.0	18.5		-1.0	-1.0	
08/ 27	18.5	-1.0		-1.0	18.5		-1.0	-1.0	

SUMMARY STATISTICS

SITES	MEAN	STD DEV	MIN	MAX
	16.2	2.2	6.5	18.5
	6.5	6.5	6.0	6.5
	8.0	8.0	4.0	8.0
	10.0	18.5	8.0	18.5

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/3/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal algal col. fishy			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple warm	many clouds v. lt. rain ripple warm	WATER LEVEL OF LAKE: 613.86 RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
7/1/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate slight minimal minimal none musty			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple hot calm	overcast v. lt. rain ripple hot calm	WATER LEVEL OF LAKE: 613.65 normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS: summer lake level to be around 614.00
7/2/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	hazy no rain ripple warm E-NE	hazy no rain ripple hot NE	WATER LEVEL OF LAKE: above normal 1" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: none ADDITIONAL COMMENTS: site #1 - ripple waves, site #2 & #3 - small waves
7/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	mod. brown large moderate minimal minimal none no odor	mod. brown large moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot NE	overcast lt. rain ripple warm NE	WATER LEVEL OF LAKE: above normal 4" RECREATIONAL USAGE: power boating LAKE MANAGEMENT: 7/6/81 ADDITIONAL COMMENTS: 2-3" rain on 7/4/81 no test due to lack of personnel, due to preparation for 4th.

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/7/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate minimal minimal minimal none no odor	lt. brown moderate minimal minimal minimal none no odor	lt. brown moderate minimal minimal wood chips no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot S	few clouds no rain ripple warm NE	above normal 1-2" power boating, waterskiing LAKE MANAGEMENT: 7/7/81 ADDITIONAL COMMENTS: lake is on way down from rain debris moving into test #1 area

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot SW	few clouds no rain ripple hot S	normal 6:14 power boating LAKE MANAGEMENT: none ADDITIONAL COMMENTS: site #2 small waves in addition to some waterskiers - site #3 waterskiers, small waves.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot SW	few clouds no rain ripple hot SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS: site #2 had small waves plus water skiers, site #3 same as site #1

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/10/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal minimal none no odor	brnsh-grn minimal minimal minimal minimal none no odor	lt. brown minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot NE	clear no rain ripple very hot	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS: no rain last several days, clearing up some

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot SW	few clouds no rain ripple hot SW	WATER LEVEL OF LAKE: above normal RECREATIONAL USAGE: power boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:
7/13/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal leaves no odor	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain small very hot SW	clear no rain ripple very hot SW	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS:
7/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate moderate minimal minimal oil films no odor	grn-brn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear v. lt. rain calm very hot NNE	clear no rain small very hot SW	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS: thunderstorms 1/2 hr. ago
7/15/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn slight moderate minimal minimal none no odor	grn-brn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds lt. rain calm no SE	clear no rain small very hot SE	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS: minimal boat traffic at sites 1 & 3, moderate traffic at site 2

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/15/81	WATER COLOR: moderate moderate minimal minimal none musty odor:	grn-brn moderate moderate minimal minimal none musty			CLOUD COVER: precipitation: waves: air temperature: wind direction:	overcast no rain ripple warm NW	few clouds v. lt. rain ripple hot calm	WATER LEVEL OF LAKE: normal 613.99 RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/16/81	WATER COLOR: moderate moderate minimal minimal none no odor odor:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: precipitation: waves: air temperature: wind direction:	few clouds no rain calm hot N	few clouds no rain calm hot S	WATER LEVEL OF LAKE: below normal RECREATIONAL USAGE: waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS: site 2 was overcast. Site 3 also overcast

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/17/81	WATER COLOR: slight slight minimal minimal none no odor odor:	grn-brn slight slight minimal minimal none no odor	grn-brn moderate slight minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: precipitation: waves: air temperature: wind direction:	hazy no rain calm warm NE	many clouds lt. rain calm warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS: Water from rain reaching sites

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/20/81	WATER COLOR: moderate moderate minimal minimal none no odor odor:	lt. brown moderate moderate minimal minimal none no odor	mod. brown moderate moderate minimal minimal none no odor	mod. brown moderate moderate minimal minimal none no odor	CLOUD COVER: precipitation: waves: air temperature: wind direction:	many clouds no rain ripple hot SE	overcast mod. rain ripple hot SE	WATER LEVEL OF LAKE: below normal RECREATIONAL USAGE: boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS: Much rain over weekend

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal minimal none	lt. brown moderate moderate minimal minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain calm warm	many clouds no rain small warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS: Greg Stengel

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate	lt. brown moderate	lt. brown moderate	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple warm N	overcast no rain ripple hot SE	(not much) above normal WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: Greg Stengel

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/22/81	WATER COLOR: brnsh-grn SEDIMENT: moderate ALGAE: moderate WEEDS AT SAMPLE SITE: minimal WEEDS NEAR SHORE: minimal OTHER SUBSTANCES: none ODOUR: no odor	1t. brown moderate moderate minimal minimal none	1t. brown moderate moderate minimal minimal none	1t. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple hot N	few clouds no rain small warm NE	WATER LEVEL OF LAKE: RECREATIONAL USAGE: boating, water skiing fishing, power

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PREECEDING 24 HOURS	OTHER COMMENTS
7/23/81	WATER COLOR; SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast v. lt. rain calm warm E	clear no rain calm warm N	WATER LEVEL OF LAKE: below normal .6 RECREATIONAL USAGE: none LAKE MANAGEMENT:

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/26/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast mod. rain small warm NW Greg Stengel	overcast mod. rain small warm NW	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: sailing, waterskiing, power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/27/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	mod. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast heavy rain ripple warm E Greg Stengel	overcast heavy rain ripple warm E	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS: much rain

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none no odor	mod. brown moderate moderate minimal minimal none no odor	mod. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast mod. rain small warm S Greg Stengel	overcast heavy rain small warm E	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/29/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	lt. brown moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain small warm NE Charles Stone	overcast v. lt. rain small warm NE	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/30/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain small warm NE	few clouds no rain small warm NE	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: site 2 had power boating

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/31/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown large moderate minimal minimal oil films clippings no odor	mod. brown large moderate minimal minimal oil films clippings no odor	mod. brown large moderate minimal minimal oil films clippings no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm warm	clear no rain calm warm	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/1/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm hot S	clear no rain calm hot	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: Strong current

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/2/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate moderate minimal minimal none	lt. brown moderate moderate minimal minimal none	lt. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain calm hot N	many clouds heavy rain small-mod. hot	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: 2" of rain last night in short period, last rain fill river.

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/4/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn large slight minimal minimal none musty			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple hot calm	few clouds no rain ripple hot calm	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: (613.39) below normal fishing

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/5/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple warm S	clear no rain ripple hot SE	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS: Wind at site 3 was from north

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain ripple warm SW	overcast heavy rain ripple warm S	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/7/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	brnsh-grn moderate moderate minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain ripple warm SW	heavy rain lt. rain small warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight moderate moderate minimal minimal none	lt. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast vry. lt. rain small warm W Chuck Stone	few clouds vry. lt. rain small warm W	WATER LEVEL OF LAKE: power boating & waterskiing RECREATIONAL USAGE: power boating & waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none	lt. brown moderate moderate minimal minimal none	moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain ripple hot SW Chuck Stone	overcast no rain small warm W	WATER LEVEL OF LAKE: above normal 7" RECREATIONAL USAGE: power boating & water-skiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

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DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/11/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain ripple hot W Chuck Stone	overcast vry. lt. rain small warm W	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: power boating & waterskiing & fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/12/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none	lt. brown moderate moderate minimal minimal none	mod. brown moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	hazy no rain ripple hot SW Chuck Stone	clear no rain ripple hot SW	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating & waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/13/8	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn minimal minimal minimal minimal none no odor	brnsh-grn minimal minimal minimal minimal none no odor	brnsh-grn minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast no rain ripple warm S Dan McMinn	few clouds no rain moderate warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/14/8	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate slight minimal minimal none no odor	brnsh-brn moderate slight minimal minimal none no odor	brnsh-grn moderate slight minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast no rain ripple small SW Jeff Wilke	clear no rain calm hot S	WATER LEVEL OF LAKE: RECREATIONAL USAGE: fishing, sailing power boating, sailing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/15/8	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate slight minimal minimal none musty			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain small hot W James Mayhugh	few clouds vry. lt. rain small hot W	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/17/8	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate slight minimal minimal none no odor	vry. brown moderate slight minimal minimal none no odor	vry. brown moderate slight minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	many clouds no rain white caps warm NE Jeff Hott	overcast no rain white caps warm SE	WATER LEVEL OF LAKE: above normal 6" RECREATIONAL USAGE: fishing, power boating LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/18/87	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight slight minimal minimal none	lt. brown slight slight minimal minimal none	lt. brown slight slight minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain small warm NE	many clouds no rain white caps warm	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/19/87	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn slight slight minimal slight none	lt. brown slight slight minimal slight none	lt. brown slight slight minimal slight none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	hazy no rain ripple warm NE	few clouds no rain small warm NE	WATER LEVEL OF LAKE: power boating, water skiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/20/87	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate moderate minimal minimal none	brnsh-grn moderate moderate minimal minimal none	brnsh-grn moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain ripple warm NE	hazy no rain ripple warm NE	WATER LEVEL OF LAKE: below normal 2" RECREATIONAL USAGE: none LAKE MANAGEMENT: ADDITIONAL COMMENTS: Site 2 had small waves Site 3 also had small waves.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/21/87	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. brown moderate slight minimal minimal none	lt. brown moderate slight minimal minimal none	musty	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	clear no rain calm warm calm	clear no rain ripple warm calm	WATER LEVEL OF LAKE: below normal 4" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS: James Maylugh

TABLE 4. FIELD OBSERVATIONS, DECATUR LAKE, MACON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/8/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn moderate slight minimal minimal none musty			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain calm warm calm	clear no rain calm warm calm	WATER LEVEL OF LAKE: below normal 6" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	grn-brn slight slight minimal minimal none fishy			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain calm cool calm	clear no rain ripple warm calm	WATER LEVEL OF LAKE: below normal 9" RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
10/6/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brush-grn slight slight minimal moderate none fishy			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain small cool N	many clouds lt. rain moderate warm N	WATER LEVEL OF LAKE: (6/13.15) RECREATIONAL USAGE: fishing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
10/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green slight slight minimal moderate none fishy			CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain small cool NE	few clouds no rain small cool NE	WATER LEVEL OF LAKE: (6/13.23) RECREATIONAL USAGE: below normal 9" LAKE MANAGEMENT: ADDITIONAL COMMENTS:

TABLE 5

TURBIDITY (NTU) IN SURFACE WATER SAMPLES FROM
LAKE DECATUR, MACON COUNTY, ILLINOIS, 1981

<u>DATE</u>	<u>SITE 1</u>	<u>SITE 2</u>	<u>SITE 3</u>	<u>MEAN</u>	<u>STD. DEV.</u>
810702	19.0	15.0	20.0	18.0	2.65
810710	27.0	28.0	34.0	29.7	3.79
810717	1.6	2.1	3.0	2.23	0.71
810724	15.0	26.0	39.0	26.7	12.01
810731	24.0	27.0	31.0	27.3	3.51
810807	8.0	20.0	32.0	20.0	12.0
810814	42.0	35.0	17.0	31.3	12.9
810821	8.4	5.9	9.0	7.77	1.64

<u>STATISTICS</u>	<u>OVERALL LAKE STATISTICS</u>		
MEAN	18.1	19.9	23.1
STD. DEV.	12.9	11.5	12.9
MIN.	1.6	2.1	3.0
MAX.	42.0	28.0	39.0

TABLE 6

TOTAL SUSPENDED SOLIDS (MG/L) IN SURFACE WATER SAMPLES
FROM LAKE DECATUR, MACON COUNTY, ILLINOIS, 1981

<u>DATE</u>	<u>SITE 1</u>	<u>SITE 2</u>	<u>SITE 3</u>	<u>MEAN</u>	<u>STD. DEV.</u>
810702	17.0	23	29	67.3	89.19
810710	13	40	76	43.0	31.61
810717	12	26	46	28.0	17.09
810724	21	47	75	47.7	27.01
810731	38	78	74	63.3	22.03
810807	13	34	102	49.7	46.52
810814	69	40	16	41.7	26.54
810821	52	36	17	35.0	17.52

STATISTICSOVERALL LAKE
STATISTICS

MEAN	46.0	40.5	54.4	47.4
STD. DEV.	55.43	17.02	31.91	36.46
MIN.	12	23	16	12
MAX.	170	78	102	170

TABLE 7

VOLATILE SUSPENDED SOLIDS (MG/L) IN SURFACE WATER SAMPLES
FROM LAKE DECATUR, MACON COUNTY, ILLINOIS, 1981

<u>DATE</u>	<u>SITE 1</u>	<u>SITE 2</u>	<u>SITE 3</u>	<u>MEAN</u>	<u>STD. DEV.</u>
810702	28	5	11	14.7	11.93
810710	3	6	10	6.3	3.51
810717	0	1	4	1.7	2.08
810724	4	6	11	7.0	3.61
810731	10	10	14	11.3	2.31
810807	4	4	12	6.7	4.62
810814	12	4	2	6.0	5.29
810821	6	7	4	3.0	1.53
<u>STATISTICS</u>		<u>OVERALL LAKE STATISTICS</u>			
MEAN	8.4	5.4	8.5	7.4	
STD. DEV.	8.81	2.62	4.47	5.83	
MIN.	0	1	2	0	
MAX.	28	10	14	28	

Spatial and Seasonal Differences in Water Quality

The Secchi disc transparency of Lake Decatur ranged from a minimum of 3 inches at Site 3 on July 20 and 30 and August 17 to a maximum of 27 inches at Site 1 on June 3. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

As is typical of Illinois reservoirs, a pattern of increasing transparency and decreasing suspended solids and turbidity from the headwaters to the dam was apparent in Lake Decatur. Transparency averaged 5.5, 7.8 and 11.5 inches at Sites 3, 2, and 1 (headwaters to the dam), respectively.

Only Site 1 was sampled for the periods June 3 - July 1 and August 21 - October 21. Excluding mean values for these periods, when only Site 1 was sampled, highest daily mean Secchi transparency (14.7 inches) and the lowest mean turbidity (2.23 mg/l), TSS (28 mg/l) and VSS (6.3 mg/l) occurred on July 17. The lowest daily mean Secchi transparency occurred July 30 and August 17 and 19, while the highest daily mean turbidity occurred July 31.

Field observations of brown water color on most sampling dates indicated that transparency was primarily influenced by sediment, although a brownish-green color at some times indicated that algae may also have been a factor.

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Decatur (estimated at twice the Secchi depth) ranged from 1-4.5 feet at Site 1, from 0.75-2.8 feet at Site 2, and from 0.5-1.7 feet at Site 3. However, since Lake Decatur is so shallow, the bottom waters probably remain oxygenated from mixing due to wind and wave activity.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Decatur, a large public water supply impoundment in central Illinois, was sampled on 47 dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers recorded Secchi disc transparency, total depth, and field observations at three or four sites and reported results to the Illinois EPA. Surface water samples were also collected on six dates for analysis of suspended solids and turbidity.

The average Secchi disc transparency of Lake Decatur (8.5 inches) ranked 84th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health, and was in the range generally associated with use impairment problems for Illinois lakes. Turbidity and suspended solids were also above average for Illinois lakes.

A spatial trend of increasing transparency and decreasing suspended solids and turbidity from the headwaters to the dam was apparent in Lake Decatur. Field observations of brown water color evidenced the effect of sediment on transparency.

Lake Decatur is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of sediment and algae problems. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems. Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake.

Continued monitoring is recommended for Lake Decatur. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

Illinois State Water Survey. 1924-1981. Lake Sedimentation Surveys. Hydrology Section, Illinois State Water Survey, Urbana, Illinois.

DS:jab/sp3903C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relatively uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average

brn - brown

brnsh-grn - brownish-green

grn-brn - green-brown

grnsh-brn - greenish-brown

lt - light

max - maximum value

min - minimum value

mod - moderately

std. dev. - standard deviation

v - very

Explanatory example of lake code:

Anderson Lake

basin code

D = Illinois River Basin

RD-B05-A

denotes lake as opposed to stream

basin segment and sub-segment

letter denoting specific lake within a basin segment

*Definitions of items in sense used in text

DS:sp,6207a,1-8

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FOR
CRYSTAL LAKE, MCHENRY COUNTY, ILLINOIS

A Cooperative Citizen -
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Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

Reports were typed by Word Processing under the direction of Norma Kraus and Diane Woodyard while Field Observations and Lake Assessment Summaries were typed by Betty Pennington, Lori Whalen, Karen Janssen, and Marilyn Budd.

INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's Lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Crystal Lake is a 234 acre glacial lake located in McHenry County, 50 miles northwest of Chicago, Illinois. The lake bed is owned by the property owners. It has a maximum depth of 41 feet, an average depth of 16 feet and a storage capacity of 3,729 acre-feet (Table 1).

Crystal Lake serves as a recreational lake, used heavily for power boating and waterskiing. It is used moderately for fishing, swimming, rowboating or canoeing, sailboating and picnicking. Access is limited to Park District residents and members of property owners association. A fee is charged at Crystal Lake Park District properties.

The 3,200 acre watershed of Crystal Lake is estimated to be 60 percent managed open spaces. The lake shoreline is primarily residential.

Water level fluctuation on Crystal Lake is considered a substantial problem, while deposition of sediment, suspended sediment, algae blooms and aquatic weeds are considered moderate problems. Industrial discharge, urban storm drainage, fertilizer or pesticides from lawns/golf courses, waterfowl, sediment in lake and development in the watershed are cited as potential pollution sources.

TABLE 1. LAKE ASSESSMENT SUMMARY, CRYSTAL LAKE, MCHENRY COUNTY, ILLINOIS (RP-B03-E).

I. GENERAL INFORMATION

River Basin: Rock
Segment: B03

Ownership: bottom owned by property owners;

Surface Area (Acres): 234 at spillway elevation*

Watershed Area (Acres): 3200*

Maximum Depth (Feet): 41*

Average Depth (Feet): 15.9*

Storage Capacity (Acre/Feet): 3729*

Inflowing Stream(s):

Outflowing Stream(s):

Water Retention Time: 1.492 years

Lake Type: glacial

Year Constructed:

II. USAGE

Public Access: yes, but limited to Park Dist. residents; fee

Lake Usage:

Potable Water Supply: none

Industrial Water Supply: none

Agricultural Water Supply: none

Cooling Water: none

Recreation:

Fishing: moderate

Swimming: moderate

Power Boating: heavy to very heavy

Row Boating or Canoeing: moderate

Sailboating: moderate

Camping: none

Picnicking: moderate to heavy

Waterfowl Hunting: none

Waterfowl Observation: light

Other: waterskiing - heavy

Recreational Facilities:

Park District has 2 beaches; 2

picnic areas; 2 boat launches;

and rentals with concessions.

Shoreline Usage (Percent):

Urban (Including Streets): 10%

Residential (Including Lawns): 80%

Golf Courses:

Pasture or Grassland:

Woodland:

Row Crops:

Wetland:

Other: Park 10%

Watershed Usage (Percent):

Urban: } 25%

Residential: }

Golf Courses:

Pasture or Grassland:

Woodland: 7%

Row Crops:

Wetland: 8%

Other: Managed Open Space: 60%

III. WATER QUALITY AND PROBLEMS

General Water Quality: good (Best early Spring and Fall)

Fishing: fair when minimal boating).

Conditions and Extent:

Suspended Sediment: minimal to moderate

Deposition of Sediment: moderate

Algal Blooms: slight to moderate

Aquatic Weeds: slight to moderate

Taste and/or Odor: minimal to slight

Water Level Fluctuation: moderate to large

Fishkills: minimal

Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:

Industrial Discharge: yes

Urban Storm Drainage: yes (causes heavy siltation on NE

Septic Tanks: side after heavy rains).

Pasture or Grassland Runoff: yes

Cropland Runoff: yes

Feedlot Runoff:

Construction Site Runoff:

Fertilizer or Pesticides from

Lawns/Golf Courses: yes

Orchards:

Forestry Operations Runoff:

Mining:

Waterfowl: yes

Sediment in Lake: yes

Other: development in watershed

V. LAKE MANAGEMENT

Comments: 1975 - 1977 - copper sulfate in limited

amounts and areas for swimmers itch.

Assessment information on Crystal Lake was provided by Michael Kane, Roger Naeseth, and the City of Crystal Lake (1980). Monitoring is performed by Michael Kane and Roger Naeseth. Secchi disc depth, total depth, and field observations were recorded at three sites (located in Figure 1) on nine dates in 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Crystal Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Crystal Lake

The average Secchi disc transparency of Crystal Lake was 58.2 inches, which ranked number 17 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Crystal Lake ranged from a minimum of 41 inches at Site 2 on July 19, to a maximum of 84 inches at Sites 1 and 3 on September 23. Secchi readings were below the four feet minimum recommended for swimming on one of the nine sampling dates at Site 1 (July 19), on three dates at Site 2 (July 19, August 10 and 23) and on two dates at Site 3 (May 25 and July 19). The lower transparencies at Site 2 were probably related, in part, to the shallow depth of the site (average depth 7.9 feet) and resultant stirring up of sediment by wind and wave activity. It may also reflect the input of nutrients and sediment in the vicinity of this site.

There were seasonal differences in the transparency of Crystal Lake. Lowest transparencies were generally found in midsummer and were probably the result of algae blooms.

FIGURE 1
CRYSTAL LAKE
MCHENRY COUNTY

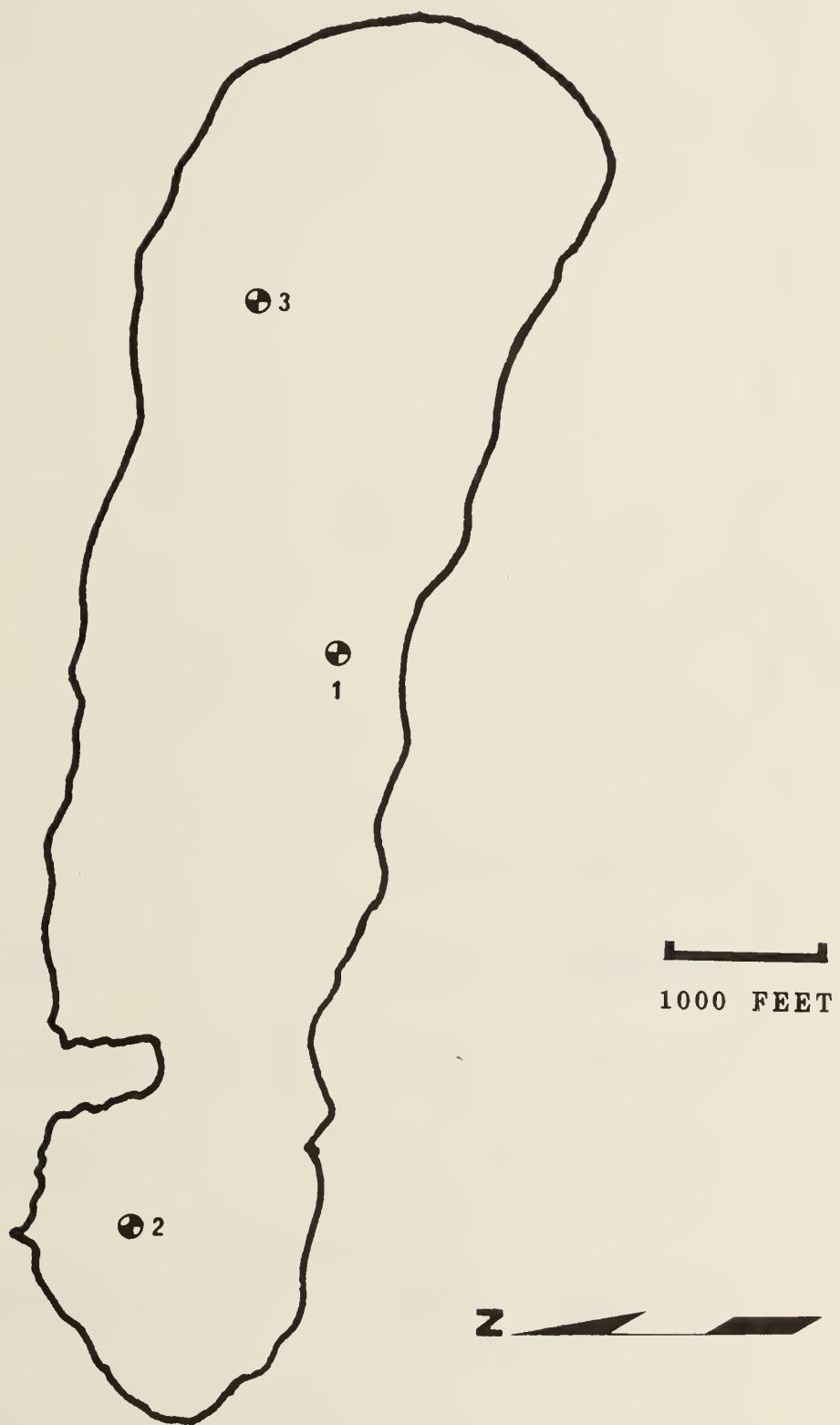


TABLE 2

SECHI DISC TRANSPARENCY (INCHES) CRYSTAL/MCHENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
85/ 2	76.0	48.0	78.0	68.0	17.3
85/ 25	68.0	48.0	42.0	50.0	0.2
86/ 19	66.0	54.0	63.0	60.0	6.0
86/ 27	56.0	51.0	54.0	53.7	2.5
87/ 19	42.0	41.0	42.0	41.7	0.6
88/ 18	66.0	42.0	60.0	56.0	12.5
88/ 23	69.0	42.0	59.0	52.7	9.0
89/ 7	66.0	60.0	66.0	64.0	3.5
89/ 23	84.0	72.0	84.0	80.0	6.0

SUMMARY STATISTICS

LAKE					
SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
MEAN	64.2	59.9	50.6	58.2	
STD DEV	12.2	10.1	14.7	13.2	
MIN	42.0	41.0	42.0	41.0	
MAX	84.0	72.0	84.0	84.0	
AV DEPTH	34.7	7.0	17.6		

-1 = missing value.

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) CRYSTAL/MCHENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
85/ 2	76.0	26.0	23.3	14.2	
85/ 25	36.0	8.0	11.0	18.5	15.2
86/ 19	35.0	8.5	16.0	19.0	13.7
86/ 27	35.0	8.0	12.0	18.5	14.6
87/ 19	33.0	8.0	18.0	16.7	12.6
88/ 18	35.0	6.0	20.0	14.5	
88/ 23	35.0	8.0	15.0	19.3	14.0
89/ 7	38.0	8.0	20.0	19.3	11.0
89/ 23	37.0	8.0	20.0	21.7	14.6

LAKE					
SITES	MEAN	STD DEV	MIN	MAX	AV DEPTH
MEAN	34.7	7.0	17.6	20.0	
STD DEV	2.1	0.7	4.6	11.6	
MIN	30.0	6.0	11.0	6.0	
MAX	37.0	8.5	26.0	37.0	
AV DEPTH	34.7	7.0	17.6		

-1 = missing value.

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) CRYSTAL/MCHENRY COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

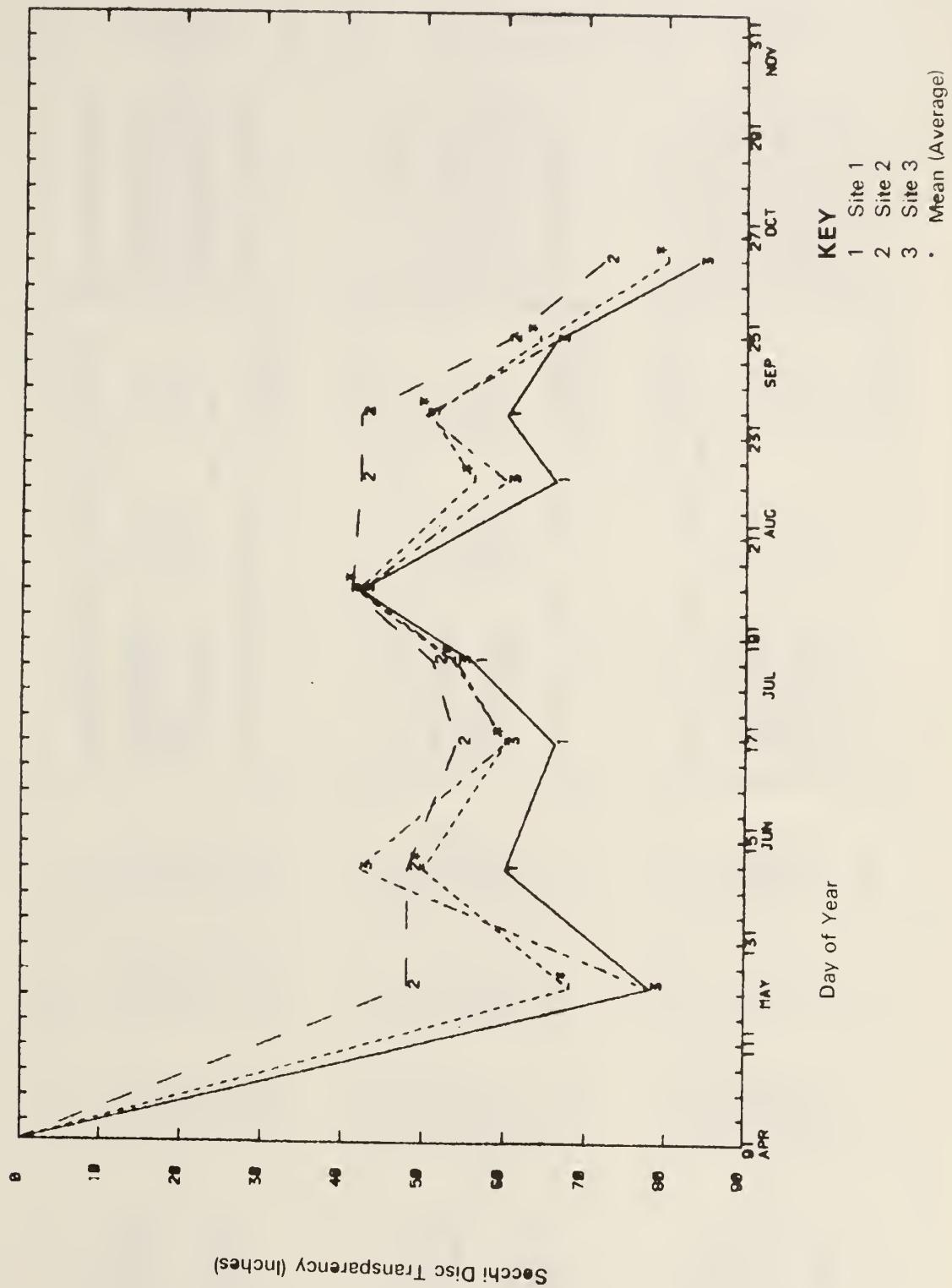


TABLE 4. FIELD OBSERVATIONS, CRYSTAL LAKE, MCHENRY COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/2/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green minimal minimal minimal minimal "clippings" leaves no odor	lt. green minimal slight large large none	clear minimal minimal minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain white caps cool SE	clear no rain white caps cool SE	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, power boating, sailing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
5/25/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green slight moderate moderate minimal aquatic weed no odor	lt. green slight moderate moderate large aquatic weed no odor	lt. green slight moderate moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	few clouds no rain moderate warm SE	many clouds no rain small warm E	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, row boating/ canoeing, sailing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
6/19/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	lt. green slight slight minimal minimal none	mod. green moderate moderate moderate moderate "clippings"	lt. green slight minimal minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain moderate warm E-SE	few clouds no rain moderate warm S	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, row boating/ canoeing, sailing LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
7/5/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal moderate minimal minimal none	mod. green minimal moderate minimal minimal none	mod. green minimal moderate minimal minimal none	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	many clouds no rain ripple hot SE	hazy no rain ripple hot SE	WATER LEVEL OF LAKE: normal RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, row boating/ canoeing, sailing, picnicking LAKE MANAGEMENT: none ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, CRYSTAL LAKE, MCHENRY COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/19/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal slight minimal minimal none no odor	mod. green minimal slight minimal minimal moderate none no odor	mod. green slight minimal minimal moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	overcast no rain ripple warm	hazy no rain calm hot	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating, waterskiing, swimming, canoeing, sailing, picnicking LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/10/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal slight seaweed no odor	grn-brn moderate moderate moderate large seaweed no odor	mod. green minimal minimal minimal slight seaweed no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain ripple warm NW	overcast lt. rain moderate warm NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating, waterskiing, swimming, canoeing, sailing, picnicking LAKE MANAGEMENT: ADDITIONAL COMMENTS:

-8-

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/23/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal slight minimal none no odor	mod. green moderate slight minimal large duckweed* no odor	mod. green minimal minimal minimal slight none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain small warm SE	many clouds very lt. rain ripple warm SE	WATER LEVEL OF LAKE: RECREATIONAL USAGE: waterskiing, row boating or canoeing, sailing & picnicking LAKE MANAGEMENT: ADDITIONAL COMMENTS:

*clumps of sediment

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/7/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal slight moderate none no odor	mod. green minimal minimal minimal slight moderate none no odor	mod. green minimal minimal minimal slight moderate none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:	few clouds no rain ripple warm SW	many clouds no rain ripple warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: power boating, waterskiing, swimming, canoeing, sailing, picnicking LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Roger Naeseth

TABLE 4. FIELD OBSERVATIONS, CRYSTAL LAKE, MCHENRY COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/23/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green minimal minimal minimal minimal none no odor	mod. green minimal minimal minimal minimal none no odor	mod. green minimal minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:-	hazy no rain ripple warm E Roger Naeseth	many clouds no rain ripple warm E	WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: OBSERVATIONS MADE BY:			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Field observations of water color and amounts of algae and suspended sediment indicate that the transparency of Crystal Lake was influenced primarily by the presence of algae. A green water color was observed throughout the sampling period and slight to moderate amounts of algae were noted on several sampling days. Abundant aquatic weeds were observed at Site 2. This may reflect the shallow nature of the site and/or nutrient input in the vicinity.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Crystal Lake (estimated at twice the Secchi depth) was from 7.0-14.0 feet at Site 1, from 6.8-12.0 feet at Site 2, and from 7.0-14.0 feet at Site 3. Since Sites 1 and 3 at Crystal Lake are deep enough to thermally stratify and had euphotic zones that were generally less than the total depths, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Crystal Lake, a glacial lake in northeastern Illinois, was sampled on nine dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Michael Kane and Roger Naeseth recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Crystal Lake (58.2 inches) ranked 17th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health and was above average for Illinois lakes. Field observations indicated that transparency was influenced primarily by algae.

Crystal Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Crystal Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from industrial discharge, urban storm drainage, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens and improve fishing. Harvesting of aquatic weeds or use of screens in selected areas might also be considered.

Continued monitoring is recommended for Crystal Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3871C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain.

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging through nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relatively uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:

Anderson Lake

 denotes lake as opposed to stream
basin segment and sub-segment
RD-B05-A
letter denoting specific lake within a basin segment
basin code
D = Illinois River Basin

*Definitions of items in sense used in text

DS:sp,6207a,1-8

UNIVERSITY OF ILLINOIS-URBANA
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VOLUNTEER LAKE MONITORING PROGRAM SPRIN
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Nat. Hist. Surv.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
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SPRINGFIELD, ILLINOIS 62706



1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

NATURAL HISTORY SURVEY
AUG 23 1981
FIRDAW



1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT
FOR
CHANNEL LAKE, LAKE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Channel Lake is a 319 acre glacial lake located in Lake County, 2 miles west of Antioch, Illinois. The lake has a maximum depth of 35 feet, an average depth of 14 feet and a storage capacity of 4,400 acre-feet (Table 1).

Channel Lake serves as a recreational lake, with very heavy usage for fishing, powerboating and waterskiing. Moderate uses include swimming, rowboating or canoeing, and sailboating. Access is unlimited, but a fee is charged.

The watershed of Channel Lake is estimated to be 50 percent cropland. The lake shoreline is primarily residential.

Deposition of sediment is considered to be a substantial problem, while suspended sediment, algal blooms and water level fluctuation are considered moderate problems for Channel Lake. Fertilizer or pesticides from lawns/golf courses is cited as the major pollution source.

Assessment information on Channel Lake was provided by Gary Berkebile, the Illinois State Water Survey (1977) and the Illinois Department of Conservation (1977). Monitoring was performed by Gary Berkebile. Secchi disc depth, total depth and field observations were recorded at three sites located in Figure 1 on six dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, CHANNEL LAKE, LAKE COUNTY, ILLINOIS (RT-B01-I)

I. GENERAL INFORMATION

River Basin: Fox
Segment: B01

Ownership: multiple

Surface Area (Acres): 319.0*
Watershed Area (Acres): 757,760*
Maximum Depth (Feet): 35.0*
Average Depth (Feet): 13.8*
Storage Capacity (Acre/Feet): 4,400*
Inflowing Stream(s):
Outflowing Stream(s):
Water Retention Time:
Lake Type: Glacial
Year Constructed:

II. USAGE

Public Access: yes

Lake Usage:

Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation: very heavy
 Fishing: heavy
 Swimming: moderate
 Power Boating: very heavy
 Row Boating or Canoeing: moderate
 Sailboating: moderate
 Camping: light
 Picnicking: light
 Waterfowl Hunting: light
 Waterfowl Observation: light
 Other: water-skiing: very heavy

Recreational Facilities:

Shoreline Usage (Percent):

Urban (Including Streets):
Residential (Including Lawns): 90%**
Golf Courses:
Pasture or Grassland:
Woodland: 5%**
Row Crops: 5%**
Wetland:
Other:

Watershed Usage (Percent):

Urban:
Residential: 40%**
Golf Courses:
Pasture or Grassland:
Woodland: 5%**
Row Crops: 50%**
Wetland: 5%**
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: good

Conditions and Extent:

Suspended Sediment: moderate (minimal*)
Deposition of Sediment: large
Algal Blooms: minimal (moderate*)
Aquatic Weeds: slight
Taste and/or Odor: minimal
Water Level Fluctuation: (moderate*)
Fishkills: minimal
Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:

Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage:
Septic Tanks:
Pasture or Grassland Runoff:
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff:
Fertilizer or Pesticides from
 Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl:
Sediment in Lake:
Other:

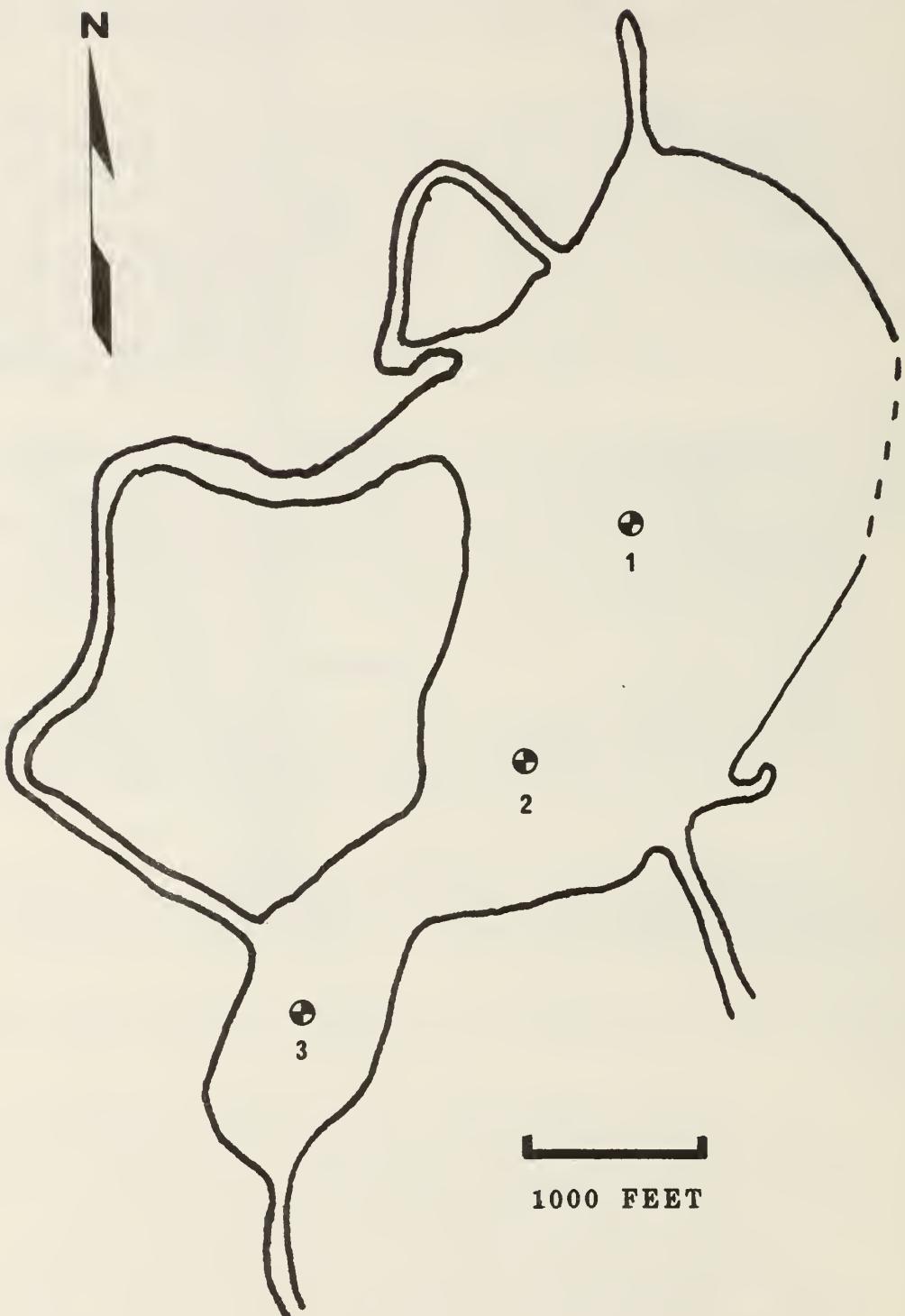
V. LAKE MANAGEMENT

Comments:

FIGURE 1

CHANNEL LAKE

LAKE COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Channel Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Channel Lake

The average Secchi disc transparency of Channel Lake was 45.1 inches, which ranked number 30 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Channel Lake ranged from a minimum of 42 inches to a maximum of 60 inches. The clarity of Channel Lake was slightly higher at Site 1 than at Sites 2 or 3. Transparency averaged 49.0 inches at Site 1 and 44.0 inches at Sites 2 and 3. Secchi readings were below the four feet minimum recommended for swimming on two of the sampling dates at Site 1 and on four of the six sampling dates at Sites 2 and 3.

Since Secchi measurements were not taken in July, September and October, seasonal differences in the transparency of Channel Lake could not be completely defined. Lowest transparencies were found on May 25 and June 14 and were probably the result of increased amounts of suspended sediment caused by heavy rains which fell twenty-four hours prior to sampling.

Field observations indicate that the transparency of Channel Lake was influenced primarily by suspended sediment in spring and algae in summer. A brownish-green water color and moderate to large amounts of suspended sediment were observed in May and June, while a green water color and moderate to large amounts of algae were noted in August.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) CHANNEL/LAKE COUNTY. ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
85/ 9	54.0	48.0	48.0	50.0	3.6
85/ 25	42.0	42.0	42.0	42.0	0.0
86/ 14	42.0	42.0	42.0	42.0	0.0
86/ 28	50.0	42.0	48.0	46.0	6.0
88/ 8	48.0	42.0	42.0	44.0	3.5
88/ 21	46.0	46.0	42.0	46.0	3.5
 SITES					
MEAN	49.0	44.0	44.0	45.7	
STD DEV	7.0	3.1	3.1	8.1	
MIN	42.0	42.0	42.0	42.0	
MAX	60.0	48.0	48.0	60.0	
AV DEPTH	38.3	25.3	21.2		

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) CHANNEL/LAKE COUNTY. ILLINOIS (VOLUNTEER DATA 1981)					
DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
85/ 9	32.0	28.0	21.0	27.2	5.6
85/ 25	39.0	25.0	22.0	28.8	8.9
86/ 14	39.0	23.0	22.0	27.8	6.3
86/ 28	42.0	27.0	21.0	30.0	10.8
88/ 8	30.0	24.0	21.0	26.0	9.6
88/ 21	30.0	24.0	16.5	27.7	10.1
 SITES					
MEAN	38.3	26.3	21.2	28.3	
STD DEV	3.3	2.0	1.6	7.8	
MIN	32.0	23.0	19.5	19.5	
MAX	42.0	28.5	22.5	42.0	
AV DEPTH	38.3	26.3	21.2		

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) CHANNEL/LAKE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

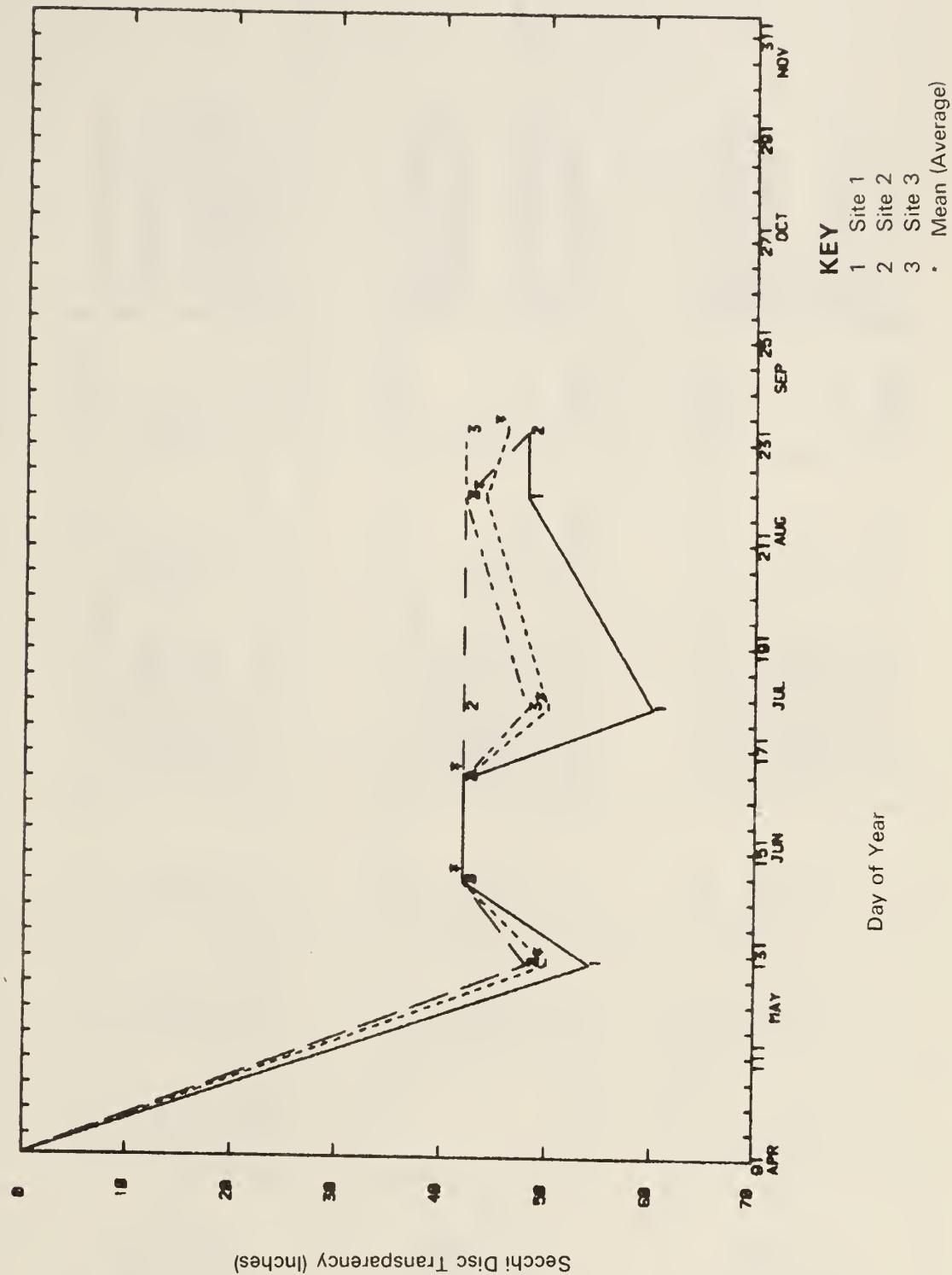


TABLE 4. FIELD OBSERVATIONS, CHANNEL LAKE, LAKE COUNTY, ILLINOIS

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/9/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	brnsh-grn moderate minimal minimal minimal none no odor	brnsh-grn moderate minimal minimal minimal none no odor	brnsh-grn moderate minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	clear no rain ripple warm SE	overcast no rain cool	WATER LEVEL OF LAKE: RECREATIONAL USAGE: boating
	OBSERVATIONS MADE BY:	Gary Berkebile			LAKE MANAGEMENT:			ADDITIONAL COMMENTS:
5/25/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:		brnsh-grn moderate minimal minimal minimal none no odor	brnsh-grn moderate minimal minimal minimal none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain small warm S	overcast mod. rain white caps cool SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: normal fishing, power
	OBSERVATIONS MADE BY:	Gary Berkebile			LAKE MANAGEMENT:			ADDITIONAL COMMENTS:
6/14/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:		grnsh-brn large moderate moderate moderate refuse no odor	grnsh-brn large moderate moderate moderate refuse no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast mod. rain white caps hot SW	overcast heavy rain white caps warm SW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: waterskiing, sailing
	OBSERVATIONS MADE BY:	Gary Berkebile			LAKE MANAGEMENT:			ADDITIONAL COMMENTS:
6/28/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:		grnsh-brn moderate slight moderate large none no odor	grnsh-brn moderate slight moderate large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION:	overcast no rain moderate warm SSSE	overcast v. lt. rain ripple warm SE	WATER LEVEL OF LAKE: RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, camping
	OBSERVATIONS MADE BY:	Gary Berkebile			LAKE MANAGEMENT:			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/18/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green moderate moderate slight large none no odor	lt. green moderate moderate slight large none no odor	lt. green moderate moderate slight large none no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: N	many clouds no rain moderate warm NW	overcast mod. rain warm NW	WATER LEVEL OF LAKE: RECREATIONAL USAGE: boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
8/21/81	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:	mod. green moderate large minimal large oil films algal mats no odor	mod. green moderate large minimal large oil films algal mats no odor	mod. green moderate large minimal large oil films algal mats no odor	CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: N	overcast no rain ripple warm	clear no rain calm warm	WATER LEVEL OF LAKE: RECREATIONAL USAGE: boating, waterskiing LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: N			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR: SEDIMENT: ALGAE: WEEDS AT SAMPLE SITE: WEEDS NEAR SHORE: OTHER SUBSTANCES: ODOR:				CLOUD COVER: PRECIPITATION: WAVES: AIR TEMPERATURE: WIND DIRECTION: N			WATER LEVEL OF LAKE: RECREATIONAL USAGE: LAKE MANAGEMENT: ADDITIONAL COMMENTS:

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Channel Lake (estimated at twice the Secchi depth) ranged from 7.0-10.0 feet at Site 1, from 7.0-8.0 feet at Site 2, and from 7.0-8.0 feet at Site 3. Since Channel Lake is deep enough to thermally stratify and had a euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Channel Lake, a glacial lake in Lake County, Illinois, was sampled on six dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Gary Berkebile recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Channel Lake (45.7 inches) ranked 30th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Channel Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Channel Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens, reduce the need for copper sulfate, alleviate taste and odor problems, and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Channel Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratification - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decomposition end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic settleable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen deficiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and enhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution emanating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy privileges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relatively uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particulate material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

ABBREVIATIONS AND SYMBOLS

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - Tight
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:

Anderson Lake

basin code
D = Illinois River Basin

RD-B05-A

denotes lake as opposed to stream
basin segment and sub-segment
letter denoting specific lake within a basin segment

*Definitions of items in sense used in text

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